PLC Based Adaptive Headlight Beam Assisting System

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Abstract: -- The headlight of vehicle poses a great danger during night driving. Drivers use automatic headlight mode so high beam and low beam switching take place based on the oncoming vehicle. Even though accidents are happening at highway during night travel because of high beam Glaring effect and low beam improper vision. When opposite vehicle crosses for a while at dark night situation like hilly road, curve road, rainy, foggy situation driver hit the obstacle, another vehicle and even pedestrian. Present headlamp mechanism uses microprocessor/microcontroller/mini computer controlled Camera-based image processing, titling of headlamp, matrix headlamp system. These mechanisms of control is costly and each functionality of car (tilting of headlamp, collision avoidance, security feature etc.)Require individual embedded system and So project depicts explore of concept PLC based Adaptive headlight beam assisting system which clearly depicts usage of PLC can be used for controlling one of the functionality of car(adaptive headlight). So further multiple features of the vehicle are controlled by single PLC beside using an individual embedded system.

Keywords — PLC, Head light.

I. INTRODUCTION

Driver safety and assistance system plays an important role in Automobile industry. It includes various concept such as adaptive headlight control system , air bag protection to driver during accident situation , Anti-lock brakes and automatic seat belt with pretension and force limiter , rearward facing cameras ,Collision warning sensors, infrared night vision and lane departure warning system etc.

In spite of public awareness regarding road transportation and strict traffic rules to bring down road accidents, the accident rate is increasing year by year. In 2012 world accident report India ranked first which is over 1,30,000 death annually by overtaking china. Reason for these accidents include problem such as drunken driving, momentary optical blindness during night travel, improper signal indication at highway and other etc. Road death increased by 40 percent between 2003 and 2008 in India Among which Adaptive Headlight plays an important role during night travel. Headlamp of car usually consists of high beam headlight and array of low beam headlight. When driver is travelling during night travel switch the automatic headlight mode where headlamp switches between high and low beam(when there is no vehicle approaching then light sensor senses vehicle on opposite direction and allow both high and low beam headlight to switch on and when another vehicle approaches from opposite direction then it switc off high beam headlamp and switch on low beam headlamp).

Trolxer effect

A good visibility of road is important during night driving, meanwhile dazzling also cause a problem . A study shows if our eyes exposed to more than 1000 lumen we experience glare. This glare due to more brightness light falls on rods and cones in our eyes. Even after light source of source glare is moved our eye remain in optical blindness this phenomena is called Trolxer effect. So whenever concentration of glare occurs at night travel which lead to increase in reaction time if the driver , this intern the main cause of accident at night travel. If the driver is moving with high speed and faces a low illumination then also driver reaction time is less due to low beam causes of accident happen because of high speed.
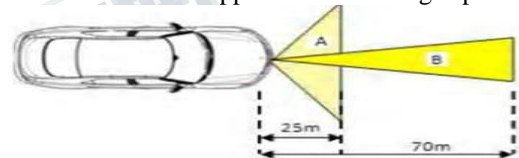

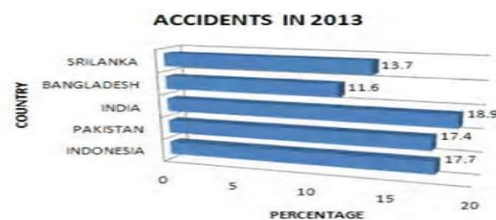Fig1.1: existing automatic high and low beam headlamp switch

Fig1.2: Accident information in Asia due to Trolxer effect

The driver has the control of the headlight which can be switched from high beam (bright) to low beam (dim) and with advance improvement automatic switch mode is provided where headlight adjust automatically according to the light requirement by the driver When the car goes over a bump, a sensor attached to the rear side of car controlled by the

vehicle's computer .The machinery for the self-adjusting headlights turns the headlight

Problem definition

Figure 1.3: Glare effect at night

Figure 1.4: Accident at highway

When vehicle moving at highway situation at night condition driver faces glaring effect due to oncoming vehicle which lead to improper vision which intern causes accident at highway. Also each function Objective Introducing PLC for Adaptive Headlight Beam assisting system operation with the use of sensors. Control the illuminate glaring proportion of Headlamp not to fall on opposite windowpane Control contrast / brightness of both high and low beam headlamp based on opposing vehicle To explore PLC usage as controlling headlamp of vehicles and integrity of multifunctional function via single controller. To give clear visual road ahead for vehicle which travel at night

INTRODUCTION TO PLC

Automation

Figure 3.1: Typical OMRON(CP1E-E10DR-A) PLC kit

Central process unit is that the brain of a PLC controller. Electronic equipment itself is typically one in every of the microcontrollers. electronic equipment additionally takes care of communication, connection among different elements of PLC controller, program execution, memory operation, overseeing input associated putting in place of an output. PLC controllers have complicated routines for memory check up so as to confirm that PLC memory wasn't broken (memory check up is finished for safety reasons

The important features of LAD Editor
Ladder logic is easy for beginning programmers to use.
Graphical representation is easy to understand and is popular around the world.
Basic Requirements
In PLC programming in order to create or change a program, the following items are needed:
CX-One Micro PLC
The CX-One Micro PLC is the smallest member of the SIMATIC CX family of programmable controllers. The central processing unit (CPU) is internal to the PLC. programmable controllers. The central processing unit (CPU) is internal to the PLC.
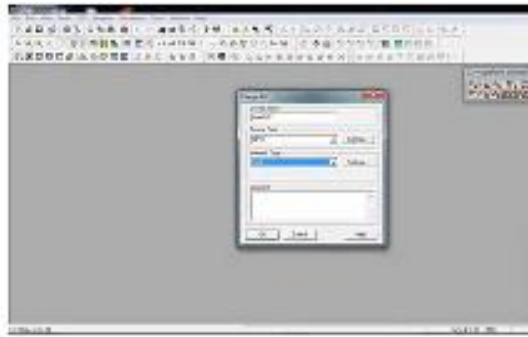**SOFTWARE AND HARDWARE IMPLEMENTATION**

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Figure: 4.1 CX-one OMRON(PLC) programming
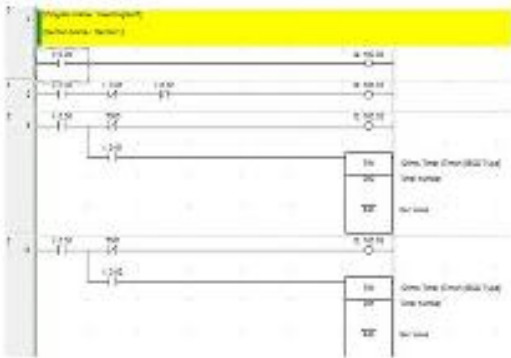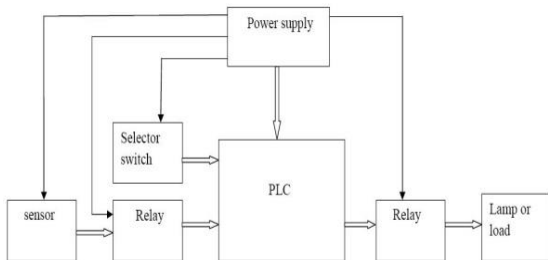
1 Ladder diagram

Figure: 4.2 Detailed version ladder diagram

Hardware implementation
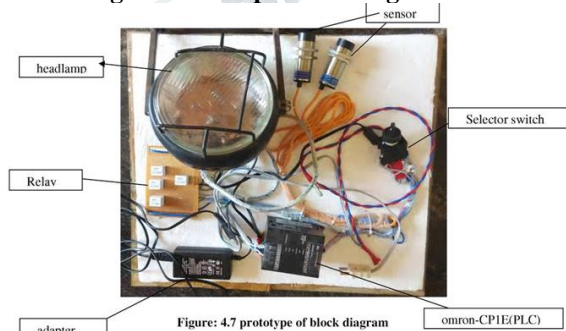

Block diagram of Adaptive headlight

Figure: 4.7 prototype of block diagram

TESTING AND RESULT OBTAINED

Power supply of 230V AC is provided for plc input Testing involves following steps:

Step1: Turn on the selector switch which indicates controlling of headlamp from manual to automatic mode is selected.
Step2: Approach the object on right side of sensor therefore as object is detected right portion of headlamp brightness decreases later as object completely passed headlamp brightens more.
Step3: Approach the object on left side of sensor therefore as object is detected left portion of headlamp brightness decreases later as object completely passed headlamp brightens more.
Step4: Approach the object on both the side of sensor therefore as object is detected both side portion of headlamp brightness decreases later as object completely passed headlamp brightens more

Fig 5.1 : when no vehicle is ahead in front of sensor(step1)

Fig 5.2 : when opposite vehicle passes by right side of headlamp(step 2)

Fig 5.3 : when opposite vehicle passes by left side of headlamp(step 3)

Fig 5.4 : when vehicles approaches from two directions of headlamp(step 4)

ADVANTAGES AND DISADVANTAGE
ADVANTAGES

- Adaptive controlling headlight without manual switching by human operator.
- Multiple functionality of vehicle is integrated in PLC which is not possible in other embedded system.
- PLC's are programmed using ladder logic which is easier when compared to assembly language or machine level language hence troubleshooting can be easily done.

5.1.2 DISADVANTAGES

- PLC requires digital input to compute data so information from analog to digital conversion is needed for some cases.
- Design of headlamp (headlights placement) used in the prototype is rare in vehicle.
- Selection of PLC is difficult with various input and output voltage based on vehicle battery voltage level.
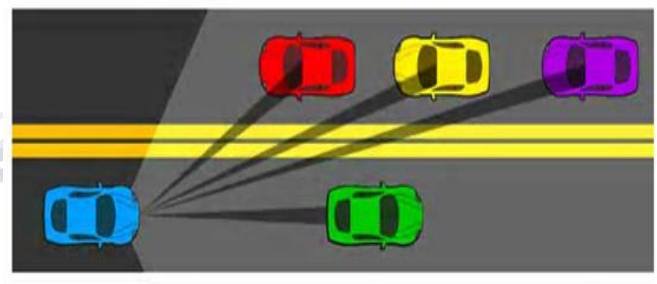
APPLICATIONS
Used in Automobile industries

CONCLUSION AND FUTURE SCOPE

II. CONCLUSION

The present testing work has clearly demonstrated the capabilities of PLC used as an automating Adaptive headlight beam control. Drive safety is one of the important aspects in automobile manufacturing industry which is not negotiated at any cost. So if the driver doesn't come to hassle any problem at night travel by glaring effect/optical blindness and for the old person whose visual capability is low they too take an advantage furthermore life of pedestrian and all oncoming vehicle accidents are avoided.

III. FUTURE SCOPE

When opposite vehicle comes near to driving vehicle controls switching of high beam and low beam light based on threshold value (distance) and control the brightness level portion of low beam not to fall on opposite vehicle windshield. PLC controls glow all array of LED light when required. Based onplacement of sensor and headlamp design plays an important role to avoid glare effect. So accident situation in highway are avoided by reducing the glaring effect of human eye during travelling. Power management is done by controlling LED array of light.

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